World Journal of Engineering Research and Technology
WJERT
www.wjert.org
Impact Factor Value: 5.924

STUDY OF THE DYNAMICS OF THE LEVELS OF SOME NUTRIENTS AND OF HYDROCYANIC ACID IN SETARIA PALLIDE-FUSCA (schumach) STAPT AND HUBBARD IN KISANGANI, DRC

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Article Received on 26/11/2020 **Article Revised on 16/12/2020** **Article Accepted on 06/01/2021**

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INTRODUCTION

The question of the feeding of domestic animals, like that of all mankind, remains so crucial that any solution, however partial, to the resolution of this phenomenon is worth encouraging. The magnitude of this issue is such that the animal and human populations of underdeveloped countries in general and those of Kisangani in particular feel affected, especially by unprecedented food competition imposed by the chief in the region. This competition can find a real solution in the improvement of the routes intended to bring food to the animals which in turn will produce more meat and milk, an essential source of animal protein and source of additional income for the breeders.

However, the Kisangani region has a large number of forage species; unfortunately, a good number of these remain unrecognized by the peasant herders who are satisfied with only a minimum of species found on a few ranges close to their homes to feed their livestock, thus reducing the possibilities of breeding in this region. Among the forage

species encountered, the grass Setaria pallide-fusca (schumach) stapf and Habbard can be identified and found spontaneously, but practically neglected by breeders.

This species is the subject of this research for the following reasons: - It is a species that is very palatable to cattle, especially ruminants (cattle, sheep, goats); - It is a drought resistant species; - This species facilitates the establishment of permanent peerages through its root system. Thus, to make better use of this fodder plant, a study on the dynamics of the rate of some nutrients and hydrocyanic acid according to the stages of growth remains the way out, since the bromatological value is variable according to the vegetative stage; that is, the age of the plant and the species because there are grasslands whose plants are more hardy and more productive than others (DUTHIL, 1967).

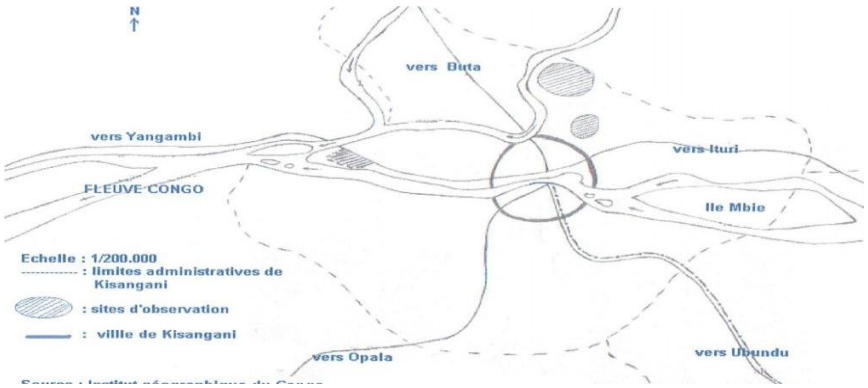
This research arrogates to itself the duty of installing experimental fields to ensure various quantitative analyzes including the determination of humidity levels, dry matter, lipids, crude proteins, carbohydrates, crude ash, crude fibers, calcium, magnesium and hydrocyanic acid.

From this analysis, the leaf samples were during all three stages of development namely: young stage, active growth stage and flowering stage including inflorescence. Thus, it is a question of analyzing the contents of nutrients and toxic principles which vary differently according to the stages of vegetative development with a considerable reduction at the young stage towards the flowering stage for proteins and mineral elements, moreover, increase with the age including carbohydrates, lipids, crude fiber, crude ash and hydrocyanic acid.

1. ENVIRONMENT, MATERIAL AND METHOD

1.1. Environment

The present research takes place in the pastures of the city of Kisangani and its surroundings.



Source: Geographical Institute of Congo (Map of pastures in the city of Kisangani and its surroundings).

1.2.Material

Two types of material were used to achieve the objectives of this research, namely: abiotic material and biotic material. The biotic material consists of the leaves of Setaria pallide-fusca harvested at the young stage, actively growing, flowering (early) and inflorescence. While the abiotic material consisted of the equipment used for the various works of the experiment and decent field. During our study an observation was made on the pasture in order to observe the health situation of the cattle below:

SOURCE: Different pastures with cattle in the city of Kisangani and its surroundings (January 2020)

1.3.Method

1.3.1. Preparatory work

The preparatory work consisted mainly of the choice and delimitation of the plot followed by the clearing and stumping of unwanted species over an area of 24m2 (5 m by 4.4 m). 2.3.2. Placement of seedlings Preparing the land by medium plowing to crumble the soil to prepare it for cultivation. The prepared chips were planted at 20cm x 20cm spacings in the pockets to a depth of approximately 10cm.

2.3.3. Harvesting

The stumps intended to be exploded for planting were stumped with a hoe and the physical preparation consisted of bursting the stumps followed by the pruning of the roots and leaves.

2.3.4.Cultivation care and observations

Cultural care consisted of replenishing the voids, regular weeding conditioned by the speed of development of the weeds. From a technical point of view, weeding has demonstrated its prowess. On this occasion, some parameters were observed in particular, the rate of recovery, the speed of growth, tillering and the production of the biomass of aerial organs. 2.3.5.

Harvesting of samples Harvesting of analysis samples was carried out after mowing to standardize the height of the stump, which consisted in cutting all the planes flush with the ground at 3 cm.

In addition, to ensure the different harvests, the field was subdivided into three sub-plots with an area of 8 m2 each, of which 5m long and 1.6m wide with 200 stumps. In each plot, the plants were mown and the harvest homogenized. This homogeneous harvest was used to take the various aliquots intended for chemical analyzes. The harvest of the first sub-plot took place 10 days after the standardization mowing. It was used to estimate the production of young biomass as well as to determine the chemical composition.

That of the second sub-plot took place 20 days after the uniformization cut and was used to estimate the amount of biomass and for chemical analyzes at the active growth stage. While that of the third sub-plot took place 30 days after the uniformization cut and served to estimate the biomass at the flowering stage for chemical analyzes and, in addition, the inflorescence of plants containing the grains at the milky stage were also analyzed. However, the amounts of biomass produced at these different stages of development of Setaria pallide-fusca.

2.3.6. Preparation of samples for chemical analysis in the laboratory

After harvesting, the samples for the determination of nutrients were dried in an oven at 60 ° C for about 8 hours; then they were reduced to powder using a mortar and its pestle, sifted through a sieve of 0.65mm mesh diameter. Samples intended for the determination of hydrocyanic acid and humidity have not been pre-dried. The powder was placed in the labeled plastic bags and then stored in the desiccator. For the different dosages, the materials, reagents, procedures and calculations were strictly followed in a normative manner.

2.3.7. Determination of humidity

Regarding the determination of humidity, oven drying methods consisted of drying a given material at a given temperature, generally at 105 ° C until the constant weight was obtained.

2.3.8. Assaying lipids

The Soxhlet method consists in extracting the fat contained in a dry and finely ground sample by training using an organic solvent. After extraction, the sample is dried and the weight loss and the fat content on dry matter are deduced.

2.3.9. Assaying total nitrogen and crude proteins

The KJELDAHL method being used, it allowed us to assay the nitrogen contained not only in the amino group, but also that of the amide, nitrate, nitrite and nucleic acids groups. This is how total nitrogen is obtained. This method is carried out in three essential steps in particular: - Mineralization or attack and / or digestion; - Distillation; - The titration.

1 Mineralization

The operation of mineralization consists in attacking the hot organic matter with concentrated sulfuric acid in the presence of a catalyst. Under normal conditions, the nitrogen of organic compounds is mineralized to ammonium sulfate depending on the reaction.

$H_2SO_4 + 2NH_3 \longrightarrow (NH_4)_2SO_4$

2 °. Distillation

Ammonia is displaced from its salt by means of a strong base NaOH, 40% depending on the reaction

$(NH_4)_2SO_4 + 2NaOH \longrightarrow 2NH_3 + Na_2SO_4 + 2H_2O\ NH_3 + H_2O\ \ NH_4OH$

The liberated ammonia is distilled by entrainment in a container containing a solution of boric acid and Tashiro's indicator; ammonium borate is then formed depending on the reaction

$3NH_4OH + H_2BO_3 \longrightarrow (NH_4)_3BO_3 + 3H_2O$

3 Titration

The liberated ammonium is titrated with 0.1 N HCl in the presence of mixed indicator and the CI ion displaces the borate.

$(NH_4)_3BO_3 + 3HCI \longrightarrow 3NH_4\ CI + H_3BO_3$

2.3.10. Determination of the crude protein content

The crude protein content is evaluated by the following expression:% P. B =% N x f.C
Legend: % P. B = crude protein content of the sample;
% N = total nitrogen content of the sample;
f.C = Conversion factor equivalent to 6.25

2.3.11. The determination of carbohydrates

Carbohydrates or carbohydrates were determined by the differences. That is to say, the dry weight of the sample (fat + protein + ash) and the residue essentially contains all of the

digestible or indigestible carbohydrates, but also some organic acids.

2. PRESENTATION OF THE RESULTS

The results of the assays carried out are given in the tables below and are interpreted as and when they are presented.

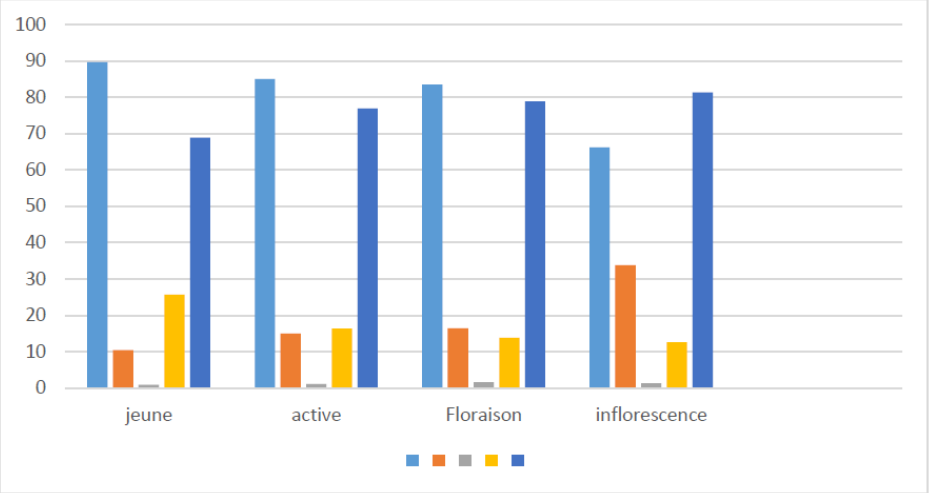
3.1. Results of the determination of moisture, dry matter, fat, crude protein, and carbohydrates

The table below summarizes the results of the determination of humidity, dry matter, fat, proteins crude, and carbohydrates of Setaria pallide-fusca. Table 1: Moisture (% M.F), dry matter (M.S), fat (% M.F), crude protein (% P.B), and carbohydrate (% H.C) content of Setaria pallide-fusca.

Composition in% Growth stage	H	M.S	M.G	P.B	H.C
young	89,6	10,4	0,9	25,7	68,9
active	85,0	15,0	1,1	16,4	76,9
Flowering	83,5	16,5	1,6	13,8	78,8
inflorescence	66,2	33,8	1,4	12,6	81,3

Legend: H = humidity,; M.S = dry matter; M.G = fat; P.B = crude protein H. C. = carbohydrate.

With regard to the table above, we note that the water content of Setaria pallide-fusca decreases from the young stage to flowering, the lowest content being recorded in the inflorescences. These average contents are respectively 89.6%; 85.0%; 83.5% and 66.2% for the leaves at the young stage, active decay, at the beginning of flowering and for the inflorescences. These results are also presented on the histogram as follows:



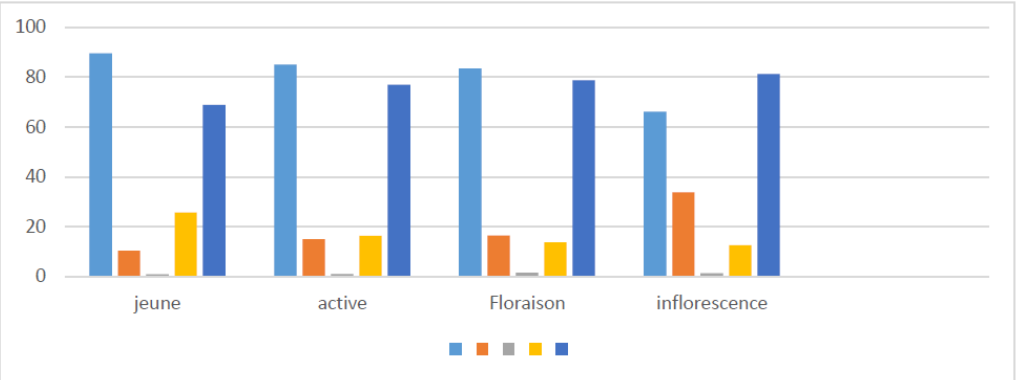
The dry matter content increases at the young stage at the inflorescence. The average contents in the leaves are 10.4%; 15.0%; 16.5% respectively for the young stage, the stage of active growth and that of the beginning of flowering. The inflorescences contain on average 33.8%. While the fat content grows from the young stage until flowering. The average contents recorded in the leaves are 0.9%; 1.1% and 1.6% respectively at the young stage, at active growth and at flowering. The inflorescences showed the average content of 1.4%, respectively less than in the leaves at the flowering stage 3.10%. In addition, the crude protein content of Setaria pallide-fusca decreases from the young stage (25.7%) to flowering (13.8%), while the lowest content recorded for inflorescences is 12.6%. . The leaves at the young, active growth and flowering stages represent the respective average contents which are 25.7%; 16.4% and 13.8%. The amounts of carbohydrates increase from the young stage to the inflorescence. The respective contents in the sheets are 68.9%; 76.9%; 78.8% and in the inflorescence 81.3% 3.2. Results of the determination of crude ash, calcium and magnesium The results relating to the content of crude ash, calcium and magnesium contained in the samples of Setaria pallide- fusca leaves at the young, active growth and flowering stages as well as those of the inflorescence are presented in the table below:

Table 2: ***Content of crude ash (C.B), Calcium and Magnesium on 100 g of dry matter in the leaves and inflorescence of Setaria pallide-fusca.***

Stade de croissance	*C.B (g/100)*	*Ca (mg/100)*	*Mg (mg/100)*
young	4,5	946,66	553,33
Active	5,6	550,00	293,33
Flowering	5,8	226,66	166,66
Inflorescence	4,7	210,00	153,33

Legend: H = humidity,; M.S = dry matter; M.G = fat; P.B = crude protein H. C. = carbohydrate.

With regard to the table above, we note that the water content of Setaria pallide-fusca decreases from the young stage to flowering, the lowest content being recorded in the inflorescences. These average contents are respectively 89.6%; 85.0%; 83.5% and 66.2% for the leaves at the young stage, active decay, at the beginning of flowering and for the inflorescences. These results are also presented on the histogram as follows:



The dry matter content increases at the young stage at the inflorescence. The average contents in the leaves are 10.4%; 15.0%; 16.5% respectively for the young stage, the stage of active growth and that of the beginning of flowering. The inflorescences contain on average 33.8%. While the fat content grows from the young stage until flowering.

The average contents recorded in the leaves are 0.9%; 1.1% and 1.6% respectively at the young stage, at active growth and at flowering. The inflorescences showed the average content of 1.4%, respectively less than in the leaves at the flowering stage 3.10%. In addition, the crude protein content of Setaria pallide-fusca decreases from the young stage (25.7%) to flowering (13.8%), while the lowest content recorded for inflorescences is 12.6%.

The leaves at the young, active growth and flowering stages represent the respective average contents which are 25.7%; 16.4% and 13.8%. The amounts of carbohydrates increase from the young stage to the inflorescence. The respective contents in the sheets are 68.9%; 76.9%; 78.8% and in the inflorescence 81.3%.

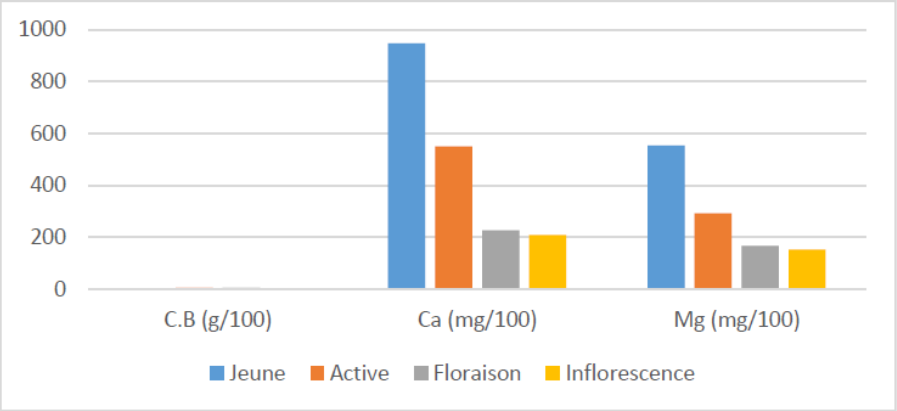
3.2. Results of the determination of crude ash, calcium and magnesium

The results relating to the content of crude ash, calcium and magnesium contained in the samples of Setaria pallide-fusca leaves at the young, active growth and flowering stages as well as those of the inflorescence are presented in the table below:

Table 2: Content of crude ash (C.B), Calcium and Magnesium on 100 g of dry matter in the leaves and inflorescence of Setaria pallide-fusca.

Growth stage	*C.B (g/100)*	*Ca (mg/100)*	*Mg (mg/100)*
young	4,5	946,66	553,33
Active	5,6	550,00	293,33
Flowering	5,8	226,66	166,66
Inflorescence	4,7	210,00	153,33

Legend: - C.B = crude ash; Ca = Calcium and Mg = Magnesium The table above reveals facts that we can illustrate on the diagram below:



Crude ash is growing in the leaves 4,52; 5.6 and 5.8 g / 100g at the young stage, the period of active growth and the flowering period respectively. The average raw ash content recorded in the inflorescences is 4.7g / 100g. In addition, the Ca and Mg content decreases from the young stage to flowering.

The respective contents in the leaves at the young, active growth and flowering stages are 946.66 respectively; 550.00 and 226.66 mg / 100g for Calcium and 553.33; 293.33 and 166.66 mg / 100g for magnesium. In the inflorescences, the trend remains the same with the respective contents of 210.00 and 153.33mg / 100g for Calcium and Magnesium.

3.3. Summary of bromatological values of Setaria pallide-fusca according to the stages of growth and those of the inflorescences

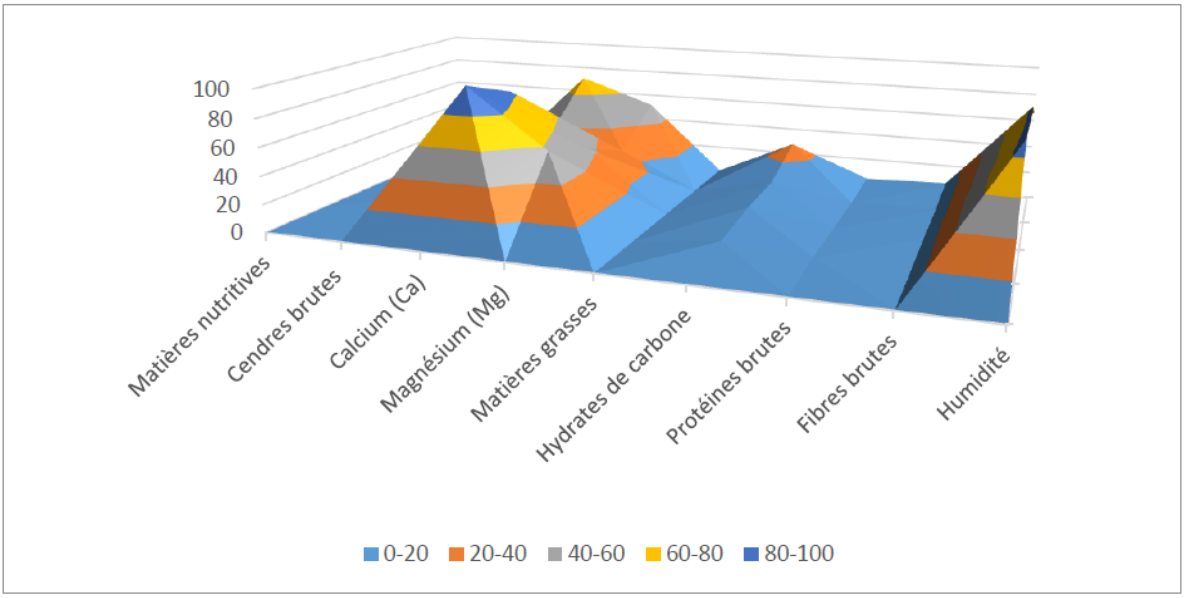
Table 3: Summary of the bromatological values of Setaria pallide-fusca according to the stages of Growth and those of the inflorescences according to the fresh weight.

Matières nutritives	Unités	Stages of growth			Inflorescence
		young	*Active*	*Flowering*	
Crude ash	g/100g	0,4	0,8	0,9	1,6
Calcium (Ca)	mg/100g	98,4	82,5	37,3	70,9
Magnesium (Mg)	mg/100g	57,5	43,9	27,4	51,8
Fat	(%)	0,09	0,1	0,2	0,4
Carbohydrates	(%)	7,1	11,5	13,0	27,4
Crude protein	(%)	2,6	2,4	2,2	4,2
Crude fibers	(%)	1,3	2,5	3,1	6,0
Humidity	(%)	89,6	85,0	83,5	66,2

It emerges from this table that the contents of different nutrients measured on the dry matter of Setaria pallide-fusca according to the three stages of growth and in the inflorescences have significantly decreased in the fresh state, conversely with the increase in the water content which outweighs the dry matter. However, as in dry matter, the levels of Calcium (Ca),

Magnesium (Mg) and crude protein decrease in samples of leaves from the young stage to flowering.

On the other hand, those of ashes, fats, carbohydrates, crude fibers increased with the age of forage. This table is also translated into a scaled distribution plateau for the nutritional values of each component as follows:



3.4. Hydrocyanic acid assay results

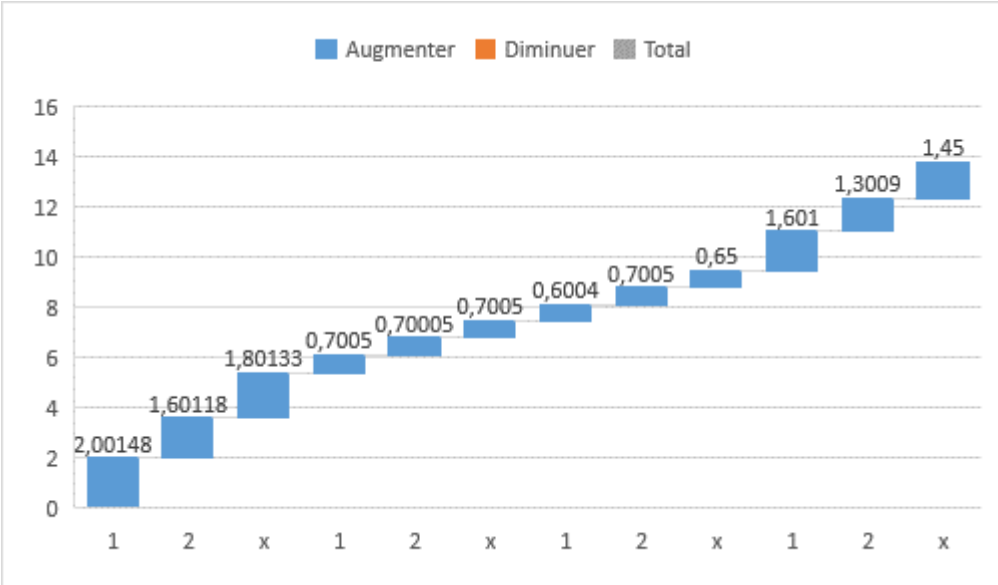
The results relating to the quantity of hydrocyanic acid contained in the samples of the leaves of Setaria pallide-fusca at the young, active growth and flowering stages as well as those of the inflorescences are presented as follows:

Table 4: Quantity of hydrocyanic acid (Q) in Setaria pallide-fusca (in mg / kg of fresh material).

Q	Stages of growth									Inflorescences		
	Young			Active			Flowering					
	1	2	x	1	2	x	1	2	x	1	2	x
	2,00148	1,60118	1,80133	0,7005	0,70005	0,7005	0,6004	0,7005	0,650	1,601	1,3009	1,4500

In view of this table, it should be noted that the quantity of hydrocyanic acid in the leaves of Setaria pallide-fusca decreases from the young stage to flowering and the respective contents recorded are 1.80; 0.70 and 0.65 mg / kg of fresh matter in the leaves of the young stage, those of the active period of growth, even those of the flowering period. In addition, the inflorescences have a content of 1.45 mg / kg of fresh matter which we believe to be fleshed

out by the following histogram:



3. General discussion of the results

It should be noted that when fresh, the leaves of Setaria pallide-fusca contain more water at the young stage than at active growth and become weak at the start of flowering, the inflorescences (62.2%) has less. On the other hand, dry matter reverses the trend of humidity. This is explained that in green feed, the herbs supplied at the young stage would be more bulky than in the last two stages of growth subject to bloat and other harmful consequences if one does not take precautions such as its association with other plants less bulky and easily digestible.

Finally, fat in the dry state or just like in the fresh state, the early flowering stage is richer in this nutrient than the active growth stage and the young stage. ; its content in inflorescences 0.4% when fresh exceeds that of leaves. The great richness of the leaves of Setaria pallide-fusca remains more protein (25.7%) than at the stages of active growth (16.4% in the dry matter and 0.2 in the fresh matter) and young (0, 9% in dry matter and 0.9% in fresh matter) could be justified by high dry matter content (16.5%) and by its low water content (83.50%)

4. CONCLUSION

The object of this research was to determine the dynamics of the levels of some nutrients according to the growth stages of Setaria pallide-fusca cultivated in Kisangani, in the Democratic Republic of Congo. In connection with the research it has been identified that the leaves of Setaria pallide-fusca in the young stage have a high moisture level (89.6%)

compared to the active growth stage (85.0%) and the growth stage. flowering (83.5%) as well as that of inflorescences (66.2%). As for the dry matter, we see that the situation is the opposite to the fresh matter, the flowering stage is richer (16.5%) compared to the active growth stage (15.0%) and at the young stage we have (10.4%). It should therefore be pointed out that the lipid contents are respectively 0.9%; 1.1% and 1.6% in the leaves at the stages of active growth and flowering while the inflorescences measure 1.4%.

In the same logic, the crude protein contents e average 25.7%; 16.4% and 13.8% respectively at the young, active growth and flowering stages in the samples of defatted leaves even though the inflorescences dose on average 12.61% of this nutrient. Therefore, an abundant consumption of this fodder by animals would cover the minimum requirements for this nutrient and in association with other fodder in this case legumes would avoid the manifestations of protein deficiency in the farms of our environment. otherwise remaining equal. From the point of view of mineral elements, the calcium content is high in the leaves at the young stage (946.66mg / 100g), followed by the active growth stage (550.00mg / 100g) and finally the flowering stage (226, 66) mg / 100g).

The inflorescences have an average dosage of 210.00mg / 100g. Forages from this grass at the young stage will meet the minimum requirements for this mineral element fixed at 0.26% for growing heifers and dairy cows. It is the same for the fodder during active growth while this same fodder at the flowering stage will no longer be able to cover the animal's calcium needs, the deficit of which is estimated at 0.05% until the inflorescence which displays a content of 18.0%. However, the hydrocyanic acid assay results revealed that Setaria pallide-fusca dose on average 1.80mg / Kg; 0.70mg / Kg and 0.65mg / Kg respectively at the young, active growth and flowering stages. The average content in the inflorescences is 1.45mg / Kg of fresh matter.

However, from the young stage until flowering, the hydrocyanic acid content does not reach the toxic threshold of 0.02%. Therefore, this grass would be suitable to be grazed or served for green forage. The inflorescences which dose fairly high levels of nutrients up to 4.2% of crude protein in the fresh state and 12.6% in the dry state can be incorporated into the ruminant and poultry rations in the form of of powder. Taking into account the fluctuation of the content of nutrient and hydrocyanic acid dosed, the results obtained partially confirm our general hypothesis because in the samples of dry leaves, the contents of water, crude protein, Calcium and Magnesium decreased appreciably with age and those of carbohydrates, lipids

and crude ash increased with age as stated at the outset. Whereas hydrocyanic acid has rather decreased with the age of the forage but partially invalidates as hydrocyanic acid increases with age.

In view of the results of our chemical analyzes illustrated above, Setaria pallide-fusca is a grass of appreciable bromatological value which deserves to attract the attention of breeders in our environment for its culture with a view to its administration in large quantities in domestic animals.

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